

*Bdeogale crassicauda*. By Mark E. Taylor

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***Bdeogale* Peters, 1850**

*Bdeogale* Peters, 1850:94. Type species *Bdeogale crassicauda* Peters, 1850, by subsequent designation (Thomas, 1882:81). *Galeriscus* Thomas, 1894:522. Type species *G. jacksoni* Thomas, 1894:522.

**CONTEXT AND CONTENT.** Order Carnivora, Family Viverridae, Subfamily Herpestinae, Genus *Bdeogale* with two distinct species, *B. crassicauda* and *B. nigripes* (including *B. jacksoni*).

***Bdeogale crassicauda* Peters, 1850**

Bushy-tailed Mongoose

*Bdeogale crassicauda* Peters, 1850:94. Type locality Mocambique, Tette (by restriction, Moreau et al., 1946).

*Bdeogale puisa* Peters, 1852a:82. Type locality Africa orientalis, Mossimboa.

**CONTEXT AND CONTENT.** Content in generic account above. Five subspecies of *B. crassicauda* are recognized (Coetzee, 1977). There appear to be size differences between the various subspecies (Sale and Taylor, 1970); however, the sample sizes are small and these differences may represent normal variation.

*B. c. crassicauda* Peters, 1850, see above.

*B. c. nigrescens* Sale and Taylor, 1970:11. Type locality Lukenya Hill, 37 km SE Nairobi, Kenya.

*B. c. omnivora* Heller, 1913:12. Type locality Mazeras, British East Africa.

*B. c. puisa* Peters, 1852a:82, see above.

*B. c. tenuis* Thomas and Wroughton, 1908:168. Type locality Zanzibar Island.

**DIAGNOSIS.** *Bdeogale crassicauda* is a medium-sized mongoose. Four of the five subspecies are dark brown; *B. c. omnivora* is yellowish brown. The species is characterized by four toes on both front and hind feet and a bushy tail. *B. crassicauda* is distinct from *B. nigripes* in being smaller, with head and body length less than 500 mm, and tail length less than 300 mm and body mass less than 2.0 kg. M2 is narrower than that of *B. nigripes*. The fur also is different in that *B. nigripes* has a much lighter and more grizzled appearance of the body contrasting with the dark brown of the lower legs and feet (Kingdon, 1977). In the southern part of its range, *B. crassicauda* is sympatric with Selous's mongoose, *Paracynictis selousi*. Both species have four digits on both the forefeet and the hind feet but *P. selousi* is larger and greyish in appearance with a distinctive white end to its tail (Smithers, 1983). *Bdeogale crassicauda* also is sympatric with *Rhyncogale melleri*, is larger and has five toes on both the forefeet and hind feet. Also, P4, M1, and M2 in *B. crassicauda* are noticeably thicker and more rounded than in *Paracynictis* (Pocock, 1916a). The anterior portion of the auditory bulla of *B. crassicauda* (Fig. 1) is not inflated as in *Paracynictis* (Coetzee, 1977).

**GENERAL CHARACTERS.** Ranges in measurements (in mm) for 14 bushy-tailed mongooses are: head and body length, 400 to 500; tail length, 180 to 300; length of hind foot, 70 to 84; ear length, 20 to 37 (Peters, 1852b; Sale and Taylor, 1970; Smithers, 1983). The pelage is composed of a dense underfur and longer guard hairs. The underfur is greyish buff in southern forms (Smithers, 1983) grading to a yellowish brown in northern races (Sale and Taylor, 1970). The guard hairs are about 5 mm long on the forehead increasing in length toward the rump where they reach a length of about 45 mm. They are banded with white annulations and the degree and extent of the banding is variable. The hind foot is haired to the back of the plantar pads but the forefoot has a short naked

section immediately behind the pads. The head is rounded for a viverrid. The rhinarium encloses the nostrils and has a fine depression in front that, continuing downward, divides the hairy portions of the upper lip (Peters, 1852b; Smithers, 1983).

**DISTRIBUTION.** This mongoose is rare and there are relatively few records of its distribution (Fig. 2). It has been collected

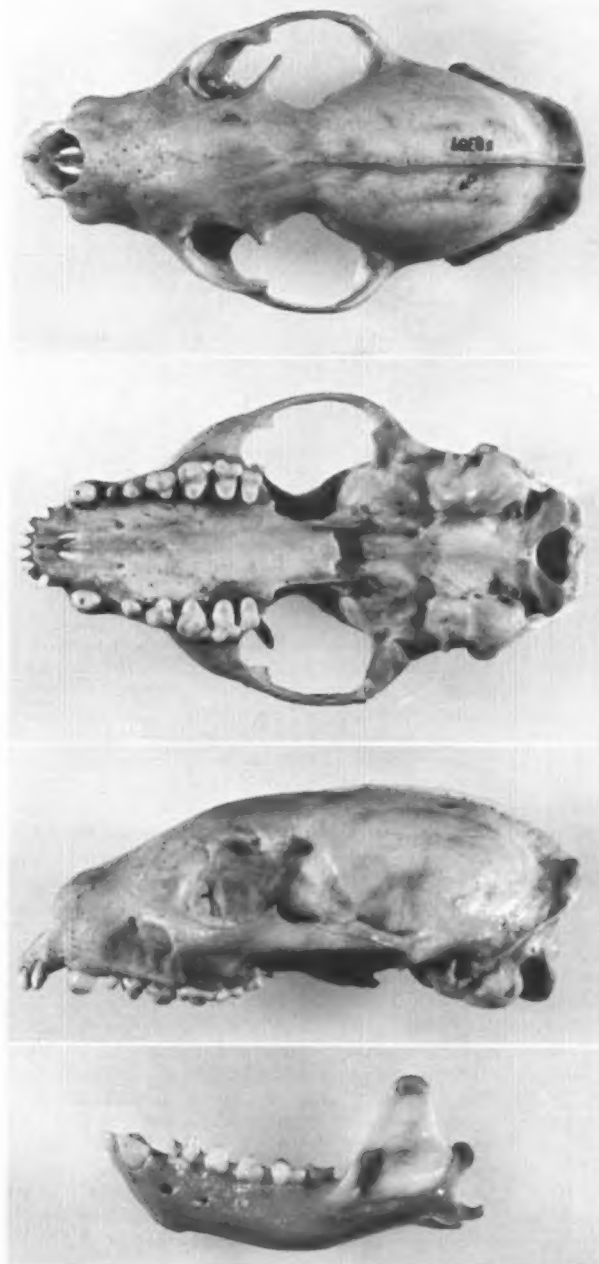


FIG. 1. Dorsal, ventral, and lateral views of the skull and lateral view of the lower jaw. Male specimen (Royal Ontario Museum 58389) from near Nairobi, Kenya.

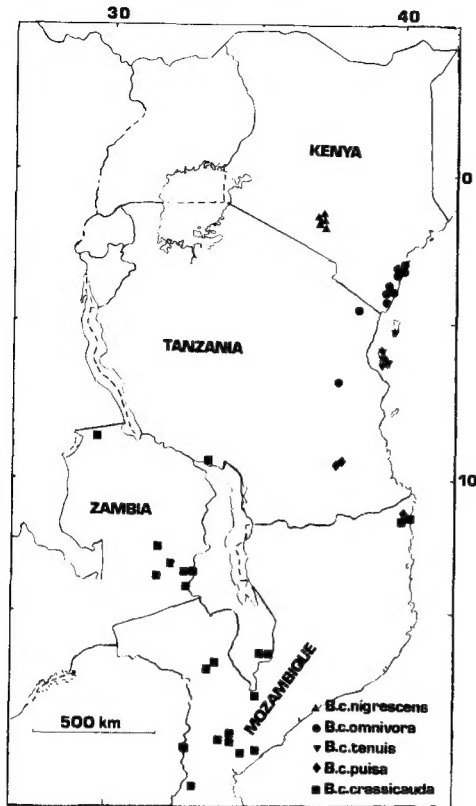


FIG. 2. Distribution of *Bdeogale crassicauda* modified after Taylor (1986).

in scattered localities in East Africa from 1°28'S to 20°10'S. It does not penetrate far into the west although Ansell (1978) and Smithers (1983) reported specimens from southeastern Zaire and northern and eastern Zimbabwe. *B. crassicauda* is not sympatric with *B. nigripes* found in forests of central and west Africa with some isolated populations occurring in remnant forests in East Africa. There are no fossil records of the genus or species.

**FORM.** The type specimen of *Bdeogale crassicauda* had a head and body length of 400 mm, tail length of 300 mm, and a hind foot length of 95 mm (Peters, 1852b). There do not appear to be appreciable differences in size between males and females although males may be slightly heavier (Smithers, 1983). Claws are stout, slightly curved, and usually show considerable wear; the front are 8 to 9 mm long and the rear 10 to 11 mm (Smithers, 1983). The eye has a horizontal pupil (Peters, 1852b) with a greyish-brown iris (Ansell, 1965). The vulva is only a short distance below or in front of the inferior edge of the anal sac. The naked area is sometimes broadly continuous with that of the sac as in *B. c. puisa* (Pocock, 1916b). The baculum is about 15 mm long (Peters, 1852b). There are two pairs of abdominal mammae (Ansell, 1965).

Skull elongated with an ovoid braincase; it is broadest at the level of the glenoid articulation. Postorbital bars never complete, supraoccipital crest well developed and the sagittal crest, high at the back of the braincase, tapers anteriorly and disappears at the level of the postorbital constriction (Fig. 1). Zygomatic arches robust suggesting well-developed masseters, and the high coronoid process of the mandible indicates a large area for the attachment of the temporalis muscle. Ranges of measurements of the skull (in mm) are: condylobasal length, 80.8 to 87.9; zygomatic width, 44.1 to 48.5; interorbital width, 16.4 to 20.6; postorbital constriction, 14.0 to 16.6; palate length, 45.0 to 49.5; palate width at M1, 25.2 to 28.0; length of upper tooth row, 35.2 to 38.5; width of M1, 5.9 to 7.0; distance between orbit and infraorbital foramen, 2.3 to 4.5 (Sale and Taylor, 1970).

The dental formula is  $i\ 3/3; c\ 1/1; p\ 4/4; m\ 2/2$ , total 40. Upper incisors long, well separated from each other, forming a curved row; lower incisors lie tightly together. Upper canines nearly straight, with sharp cutting edges in front and behind, and flattened inner



FIG. 3. Drawing of *Bdeogale crassicauda omnivora*, a yellowish-brown subspecies with distinctly dark-brown legs from East African coastal regions. Reprinted from Kingdon (1977) with permission.

surfaces; the lower ones distinctly curved (Petter, 1969). First premolars are small and peglike; second premolars like those of *Herpestes*, whereas the third and fourth are broader than those of other viverrids of comparable size. The two molars wear to broad rectangular surfaces (Smithers, 1983).

The vertebral formula is C 7, T 14, L 6, S 2 to 3, and Ca 25 (24), total 53 to 55. There is no clavicle. There are eight sternbrae, attached to nine pairs of true ribs (Peters, 1852b). Taylor (1974, 1976) concluded that *B. crassicauda* was modified toward a cursorial habit. It lacks first digits, has relatively high humerometacarpal indices, and metacarpals II, III, and IV are almost equal in length. The posterior displacement of the humeral head is 10%, as in other cursorial viverrids, but different from the 5% of arboreal *Nandinia*. Posteromedial flange of the olecranon almost conical and situated in a relatively proximal position, allowing the *M. epitrochlearis*, that inserts on it, to act more as an extensor than as a supinator. Radial notch of the ulna is not set in deeply as in most cursors. First metacarpal reduced to a small splint; there is no radial sesamoid; and the proximal articular surface of the scapholunar does not extend to the radial distal articular surface as it does in *Nandinia*, indicating a restricted movement in the carpus. Metacarpals more cylindrical than waisted, and are not widely spaced. These characters indicate a digitigrade manus, less flexible than those of arboreal species. In the hind leg, the most distinctive feature is absence of the first metatarsal and closely adjoined remaining metatarsals that do not permit much space for the *M. interossei*. In *B. crassicauda*, the head of the tibia is relatively wide compared with that of *Nandinia* and *Ichneumia*. The narrower head of the tibia in *Ichneumia* is associated with the development of the tibial crest and powerful extensors of the lower leg (Taylor, 1976). Limb proportions are: brachial index, 88; crural, 109; tibioradial, 74; intermembral, 85; humerometacarpal, 37; femorometatarsal, 49 ( $n = 5$ ). Fractures of the skeleton were reported (Taylor, 1971) and a radius and ulna of *B. c. omnivora* were broken during adult life; the radius mended but the ulna, in spite of callus growth, did not.

The tongue has large, prickly, backward-pointing horned papillae. In the type description, the stomach is stated to be about 14 cm long, the small intestine 135 cm with an 8 mm diameter. The large intestine is 24 cm long with a diameter of 15 mm and an appendix 3 cm long. The liver has three main lobes, the center one contains the gall bladder on its right part. The spleen is flattish, 60 mm long and 15 mm wide. The pancreas is large and lobed. Kidneys are simple, unlobed, and 3.5 cm long. The uterus has two horns, each 20 mm long (Peters, 1852b).

**ONTOGENY AND REPRODUCTION.** Kingdon (1977) found a female with grown young in December in Kenya, but Smithers (1983) found no evidence of breeding in females taken in August, September, October, and December in Zimbabwe. However, based on data from other African viverrids, breeding probably occurs during the wetter months of the year, corresponding to the monsoon periods from March to May and from October to December in the north (Taylor, 1969) and in the southern part of its range corresponding to the wetter and cooler part of the year from October to March (Smithers, 1983). There are no data on litter size, frequency of litters, period of maternal care, period to maturity, or other aspects of reproduction and ontogeny.

**ECOLOGY.** In the south, *B. crassicauda* is found in the floodplains of the Shire and Pungwe rivers where on drier raised areas there is an open association of *Acacia* woodland. In north-eastern Zimbabwe, it occurs in granite koppies, whereas in the eastern districts near the confluence of the Haroni and Lusitu rivers it is found in the fringes of the lowland forest. In Malawi and parts of Zimbabwe, it is found in *Brachystegia* woodland, and riverine associations and mopane woodland (Smithers, 1983). In the northern parts of its range, *B. c. nigrescens* occurs on rocky hills southeast of Nairobi. The vegetation is grassland with scattered shrubs and trees, especially *Acacia* sp. and *Commiphora africana*. There also are rambling herbs on the hillsides such as *Cissus quadrangularis* and *Sarcostemma*, and several species of *Ficus* (Sale and Taylor, 1970). At the coast, *B. c. omnivora* (Fig. 3) occurs most commonly in thick rain forest, a narrow strip of forest now fragmented by clearings and agricultural areas. There are no descriptions of the sites where *B. c. tenuis* has been caught on Zanzibar but because most of the island is covered with palm plantations and patches of thickets, this mongoose must occupy a different type of habitat than on the mainland (Taylor, 1986).

There are relatively few data on food habits of these mongooses although they seem to be largely insectivorous (Ansell, 1965; Kingdon, 1977; Smithers, 1983). Smithers (1983) analyzed the contents of seven stomachs and found insects present in six, reptiles in four, amphibians in two, murids in two, millipedes in two, spiders, scorpions, and gastropods and some grass in one. Insects included *Macrotermes falciger*, *Odontotermes badius*, *Trinervitermes rhodesiensis*, and unidentified orthopterans, coleopterans, and their larvae. Reptiles included the variable skink, *Mabuya varia*, Kirk's rock agama, *Agama kirkii*, and the common house snake, *Boaedon fuliginosus*. Amphibians included the red toad, *Bufo carens*, the toad, *B. pusillus*, Bocage's burrowing frog, *Leptopelis bocagii*, savanna ridged frog, *Ptychadena superciliaris*, and the Mozambique ridged frog, *P. mossambica*. The murids were identified as juvenile multimammate mice, *Praomys natalensis*. The spider was a baboon spider *Harpactira* sp. and the gastropod, a slug, *Laevicaulis natalensis*. Kingdon (1977) also stated that the species feeds almost entirely on insects, particularly ants and termites. He found caterpillars, crickets, grasshoppers, beetles and their larvae, a dragonfly, and spiders (taxa not provided). Sale and Taylor (1970) found that *B. crassicauda* was not an accomplished killer and, although it could catch young wild rats, it was inefficient at killing them as it was with a stripe-bellied sand snake, *Psammodphis subtaeniatus*. They found the mongoose would not eat fruits such as mangoes, bananas, or avocado pears, and it could not break eggs although it would lap up their contents if they were broken for them. The mongoose had not learned the method of breaking hard objects used by many viverrids of throwing the object between its hindlegs (Hinton and Dunn, 1967).

Other similar-sized carnivores found in association with *B. c. nigrescens* include the zorilla, *Ictonyx striatus*, genet, *Genetta tigrina*, black-tipped mongoose, *Herpestes sanguineus*, and white-tailed mongoose, *Ichneumia albicauda* (Sale and Taylor, 1970). *B. c. omnivora*, caught in the coastal forest coexisted with the civet, *Civettictis civetta* (Taylor, 1986). There is no information on community associations from more southern parts of its range but presumably the more common species are found with *B. crassicauda*.

The only recorded incident of predation on this mongoose is by Peters (1852b), who found one of his specimens, a young male, in the stomach of a large *Vipera rhinoceros*.

Although the species is distributed through a large part of eastern Africa, it is rare (Ansell, 1965, 1978; Dorst and Dandelot, 1970; Peters, 1852b; Smithers, 1983; Taylor, 1986; Thomas, 1882). Reasons for its rarity do not seem to be associated with its habitat or with a specialized diet; Taylor (1986) proposed some as yet unknown, intrinsic causes of its rarity.

**BEHAVIOR.** This mongoose seems to be nocturnal and solitary although occasionally individuals are sighted during the day (Ansell, 1965; Kingdon, 1977, Sale and Taylor, 1970; Smithers, 1983). Captive specimens sleep most of the day and do not come out until evening. In the wild, they probably shelter during the day in well-hidden holes. Ansell (1960) quoted from a label of a specimen from Zambia in the Kaffrarian Museum, collected by Lancaster, that they were reported to sleep in hollow trees. Their claws are stout and robust but do not reflect a fossorial habit as those of some mongooses (Taylor, 1974, 1976); likely they use their claws for scraping dirt to find insects.

A distinctive characteristic of this species is its docility when captured. They did not bark or attempt to escape from traps (Ansell, 1965; Sale and Taylor, 1970). Kingdon (1977) also noted the docility of *B. nigripes*, so it may be a behavioral characteristic of the genus.

**GENETICS.** Although no idiogram for *B. crassicauda* has been published, the karyotype of the closely related black-footed mongoose (presumably *B. nigripes*) is  $2n = 36$  and consists of 14 pairs of metacentric or submetacentric and 3 pairs of acrocentric autosomes. The X chromosome is a medium-sized submetacentric and the Y is a small submetacentric (Wurster and Benirschke, 1968).

**REMARKS.** The generic name comes from the Greek, *bdeo*, I break-wind or I stink, and *gale* meaning a marten-cat or weasel. The specific name comes from the Latin *crassus* meaning thick or dense, and *cauda* meaning a tail.

*Galeriscus jacksoni* was regarded as generically distinct from *Bdeogale* and specifically distinct from *G. nigripes* by Rosevear (1974), but Kingdon (1977) did not recognize a generic distinction and questioned a specific distinction. Honacki et al. (1982) and Smithers (1983) supported *B. jacksoni* as a distinct species. Honacki et al. (1982) recognized the family Herpestidae to include the Herpestinae Gill, 1872 (=Mungotidae Pocock, 1916b) and Galidiinae Gill, 1872 (=Galidiina Gray, 1865).

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#### LITERATURE CITED

- ANSELL, W. F. H. 1960. Mammals of Northern Rhodesia. Government Printer, Lusaka, 155 pp. + 24 maps.
- . 1965. Addenda and corrigenda to "Mammals of northern Rhodesia" No. 2. Puku, 3:14-52.
- . 1978. The mammals of Zambia. Nat. Parks Wildl. Serv., Chilanga, 118 pp.
- COETZEE, C. G. 1977. Part 8, Carnivora. Pp. 1-42, in The mammals of Africa. An identification manual. (J. M. Meester, and H. W. Setzer, eds.). Smithsonian Institution, Washington D.C. (parts paged separately).
- DORST, J., AND P. DANDELLOT. 1970. A field guide to the larger mammals of Africa. Collins, London, 287 pp.
- GILL, T. 1872. Arrangement of the families of mammals. With analytical tables. Smithsonian Misc. Coll., 11:1-98.
- GRAY, J. E. 1865. A revision of the genera and species of the viverrine animals (Viverridae), founded on the collection in the British Museum. Proc. Zool. Soc. London, 1864-1865:502-579.
- HELLER, E. 1913. New antelopes and carnivores from British East Africa. Smithsonian Misc. Coll., 61:1-15.
- HINTON, H. E., AND A. M. S. DUNN. 1967. Mongooses, their natural history and behaviour. Oliver and Boyd, Edinburgh and London, 144 pp.
- HONACKI, J. H., K. E. KINMAN, AND J. W. KOEPL. 1982. Mammal species of the world: a taxonomic and geographic reference. Allen Press and The Assoc. Syst. Coll., Lawrence, Kansas, 694 pp.
- KINGDON, J. 1977. East African mammals, an atlas of evolution in Africa. Carnivora. Academic Press, London and New York, 3A:1-476.
- MOREAU, R. E., G. H. E. HOPKINS, AND R. W. HAYMAN. 1946. The type localities of some African mammals. Proc. Zool. Soc. London, 1946:387-447.
- PETERS, W. 1850. (Untitled) Spenerische Zeitung Berlin, 25 June 1850. Reprinted in Sitzungsber. Ges. naturf. Frde. Berlin. 1839-1859, p. 94, Berlin 1912 (not seen).
- . 1852a. Über die im Mossambique. Monatsb. K. Preuss. Akad. Wiss., Berlin, February 1852, p. 81.
- . 1952b. Reise nach Mossambique I. Säugethiere Druck und Verlag, Berlin, 202 pp.
- PETTER, G. 1969. Interprétation évolutive des caractères de la denture des viverrides africains. Mammalia, 33:607-625.
- POCOCK, R. I. 1916a. A new genus of African mongooses with a note on *Galeriscus*. Ann. Mag. Nat. Hist. London, 17:176-179.

- . 1916*b*. On the external characters of the mongooses (Mungotidae). *Proc. Zool. Soc. London*, 1916:349-379.
- ROSEVEAR, D. R. 1974. The carnivores of West Africa. British Museum (Nat. Hist.), London, 548 pp.
- SALE, J. B., AND M. E. TAYLOR. 1970. A new four-toed mongoose from Kenya, *Bdeogale crassicauda nigrescens* ssp. nov. *J. E. African Nat. Hist. Soc.*, 28:11-16.
- SMITHERS, R. H. N. 1983. The mammals of the southern African subregion. Univ. Pretoria, Pretoria, 736 pp.
- TAYLOR, M. E. 1969. Note on the breeding of two genera of viverrids, *Genetta* spp. and *Herpestes sanguineus* in Kenya. *E. African Wildl. J.*, 7:168-169.
- . 1971. Bone diseases and fractures in East African Viverridae. *Canadian J. Zool.*, 49:1035-1042.
- . 1974. The functional anatomy of the forelimb of some African viverridae (Carnivora). *J. Morphol.*, 143:307-336.
- . 1976. The functional anatomy of the hindlimb of some African viverridae (Carnivora). *J. Morphol.*, 148:227-254.
- . 1986. The biology of the four-toed mongoose *Bdeogale crassicauda*. *Cimbebasia*, 8:187-193.
- THOMAS, O. 1882. On the African mongooses. *Proc. Zool. Soc. London*, 1882:59-93.
- . 1894. On a new African genus of Mustelidae. *Ann. Mag. Nat. Hist.* (13 ser.), 6:522-524.
- THOMAS, O., AND R. C. WROUGHTON. 1908. The Rudd exploration of South Africa. IX. List of mammals obtained by Mr. Grant on the Gorongosa Mountains, Portuguese S. E. Africa. *Proc. Zool. Soc. London*, 1908:164-173.
- WURSTER, D. H., AND K. BENIRSCHKE. 1968. Comparative cytogenetic studies in the order Carnivora. *Chromosoma*, 24:336-382.

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